BASIN HIGHLIGHTS REPORT
TEXAS CLEAN RIVERS PROGRAM

GUADALUPE RIVER BASIN
and the
LAVACA-GUADALUPE COASTAL BASIN
Spring 1999

This report highlights recent activities in the Guadalupe and Lavaca-Guadalupe River Basins under the Clean Rivers Program (CRP). The Texas CRP is managed by the Texas Natural Resource Conservation Commission (TNRCC), and funded entirely by fees assessed to wastewater discharge and water rights permit holders. The Guadalupe-Blanco River Authority (GBRA) together with the Upper Guadalupe River Authority (UGRA) carry out the water quality management efforts in these basins under contract to the TNRCC.

Aside from administrative requirements there are four major elements to the CRP—data collection, special studies, data analysis, and communicating results. This brief report summarizes the program in each area.

DATA COLLECTION

Historically the TNRCC and predecessor state water quality agencies along with the United States Geological Survey (USGS) were the only groups routinely collecting monitoring data on the quality of Guadalupe River Basin waters. Additional data were collected through special studies, basin planning efforts (e.g. 208 Plans) and academic research, but these did not address the need for a consistent long-term monitoring effort that could allow detection of changes and trends. Starting in the 1980s, both the GBRA and the UGRA began routine water quality monitoring and also began to fund some of the USGS data collection efforts. When the CRP began operation in 1992, one of its priorities was to expand the monitoring role of river authorities. Starting in 1994, both authorities expanded and enhanced their monitoring programs. Table 1 lists the stations and parameters currently monitored by the two authorities, and Figure 1 shows their approximate locations.

While the routine water quality monitoring work of the two river authorities through the CRP is now substantial, it is only part of the work performed in the basin. Both the TNRCC and the USGS, with authority and some federal support, continue monitoring efforts. Table 2 lists the stations currently monitored by the TNRCC. In addition, the USGS measures flow and/or water level at 25 stations in the area, and chemical parameters at 6 of these stations. One of the key roles of the CRP is to foster coordination and cooperation of these monitoring efforts.

A major part of the work to achieve this coordination has been the development and continued updating of a Quality Assurance Project Plan (QAPP). The QAPP is a

TABLE 1 GBRA AND UGRA MONITORING STATIONS

Guadalupe River Basin Surface Water Quality Monitoring Program - 1999								
TNRCC Station Id.	**Station Description**	**Latitude/ Longitude**	**County**	**Parameters**	**Frequency**	**Monitoring Types**	**Monitored By**	**Station Owner**
12570	**Dry Comal Creek at Seguin St., New Braunfels**	29º42'16" 98º07'45"	Comal	C[1] F[2] A[3] M[4]	Monthly Monthly Bimonthly Annually	Fixed	GBRA	NA[5]
12578	**Guadalupe River upstream of Lower Guadalupe Diversion Dam and Salt Water Barrier**	28º30'24" 96º53'09"	Calhoun	C A M H[10] P[11]	Monthly Bimonthly Annually Quarterly Quarterly	Fixed	GBRA	GBRA
12592	**Guadalupe River at FM 766 Bridge near Cuero**	29º08'49" 97º19'02"	DeWitt	C F A M	Monthly Monthly Bimonthly Annually	Fixed	GBRA	NA

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[1] The C symbol represents the following parameters and their TNRCC codes: 00010, Temperature, Water (Centigrade); 00094 Conductivity, Field (μmhos/cm @ 25C); 00300 Oxygen, Dissolved (mg/L); 00400 pH (standard units); 00630 Nitrate/Nitrite-Nitrogen (mg/L as N); 00665 Total Phosphorus (mg/L as P); 31616 Fecal Coliform (#/100 mL); 00530 Solids, Total Suspended (mg/L); 82079 Turbidity (NTU); 00945 Sulfate (mg/L); 00940 Chloride (mg/L); 32211 Chlorophyll-a (μg/L); 00900 Total Hardness (mg/L); and 31648 E. coli (#/100 mL).

[2] The F symbol means that a flow measurement will be provided. When possible, this information will be derived from U.S. Geological stream gages; at some sites, the proximity of a hydroelectric generating facility allows the calculation of flow based upon power generated; at the remainder of the sites field measurements will be made by GBRA Regional Laboratory personnel or UGRA personnel.

[3] The A symbol denotes the Ammonia-Nitrogen (mg/L) parameter and its TNRCC code of 00610.

[4] The M symbol denotes metals. All M samples will be collected by the GBRA. The dissolved metals to be analyzed for are 01106 Aluminum (μg/L as Al); 01090 Zinc (μg/L as Zn); 01000 Arsenic (μg/L as As); 00915 Calcium (mg/L as Ca); 01025 Cadmium (μg/L as Cd); 00925 Magnesium (mg/L as Mg); 46570 Hardness, calc, (mg/L as $CaCO_3$); 01005 Barium (μg/L as Ba); 01030 Chromium (μg/L as Cr); 01040 Copper (μg/L as Cu); 01046 Iron (μg/L as Fe); 01049 Lead (μg/L as Pb); 01056 Manganese (μg/L as Mn); 01065 Nickel (μg/L as Ni); 01060 Molybdenum (μg/L as Mo); 01145 Selenium (μg/L as Se); 71890 Mercury, total (μg/L as Hg); and 01075 Silver (μg/L as Ag).

[5] NA means not applicable. The station is not owned by anyone and is accessible to the public.

TABLE 1 GBRA AND UGRA MONITORING STATIONS (CONTINUED)

Guadalupe River Basin Surface Water Quality Monitoring Program - 1998-99								
TNRCC Station Id.	**Station Description**	**Latitude/ Longitude**	**County**	**Parameters**	**Frequency**	**Monitoring Types**	**Monitored By**	**Station Owner**
12596	**Lake Dunlap-Guadalupe River north bank at AC's Place at midpoint of Lone Star Drive**	29°40'15" 98°04'48"	Guadalupe	C F A M	Monthly Monthly Bimonthly Annually	Fixed	GBRA	NA
12598	**Canyon Reservoir (Canyon Park Marina)**	29°53'57" 98°13'24"	Comal	C A	Monthly Bimonthly	Fixed	GBRA	NA
12623	**Coleto Creek Reservoir at Boat Launching Ramp**	28°43'16" 97°10'15"	Goliad	C A	Monthly Bimonthly	Fixed	GBRA	GBRA
12626	**San Marcos River at Luling Water Treatment Plant**	29°40'02" 97°39'14"	Caldwell	C F A M	Monthly Monthly Bimonthly Annually	Fixed	GBRA	GBRA
12640	**Plum Creek at CR 135 SE of Luling**	29°39'25" 97°36'00"	Caldwell	C F A RBA[6]	Monthly Monthly Bimonthly Quarterly	Fixed	GBRA	NA

[6] RBA denotes Rapid Bioassessment.

TABLE 1 GBRA AND UGRA MONITORING STATIONS (CONTINUED)

Guadalupe River Basin Surface Water Quality Monitoring Program - 1998-99 (cont.)								
TNRCC Station Id.	**Station Description**	**Latitude/ Longitude**	**County**	**Parameters**	**Frequency**	**Monitoring Types**	**Monitored By**	**Station Owner**
12653	**Comal River at Hinman Island**	29°42'29" 98°07'26"	Comal	C F A	Monthly Monthly Bimonthly	Fixed	GBRA	NA
12658	**Guadalupe River at River Road Second Crossing, upstream of New Braunfels**	29°46'43" 98°09'37"	Comal	C F A RBA	Monthly Monthly Bimonthly Quarterly	Fixed	GBRA	NA
12668	**Blanco River at FM 165 Bridge Crossing near City of Blanco**	30°05'27" 98°24'06"	Blanco	C F A RBA	Monthly Monthly Bimonthly Quarterly	Fixed	GBRA	NA
12672	**Upper San Marcos River upstream of IH 35**	29°52'31" 97°55'54"	Hays	C F A FC-5x30[7]	Quarterly Quarterly Quarterly Semi-annually	Fixed	GBRA	NA
12674	**Cypress Creek at FM 12 at Wimberley**	29°59'46" 98°05'48"	Hays	C F A	Quarterly Quarterly Quarterly	Fixed	GBRA	NA

[7]FC-5x30 denotes sampling for fecal coliform and *E. coli* five times in a 30 day period.

TABLE 1 GBRA AND UGRA MONITORING STATIONS (CONTINUED)

Guadalupe River Basin Surface Water Quality Monitoring Program - 1998-99 (cont.)								
TNRCC Station Id.	**Station Description**	**Latitude/ Longitude**	**County**	**Parameters**	**Frequency**	**Monitoring Types**	**Monitored By**	**Station Owner**
13700	**Guadalupe River at RR 311, 1.9 mi SE of Spring Branch**	29º53'00" 98º23'00"	Comal	C F A	Monthly Monthly Bimonthly	Fixed	GBRA	NA
14932	**Geronimo Creek at SH 123**	29º40'12" 97º57'53"	Guadalupe	C F A M RBA	Monthly Monthly Bimonthly Annually Quarterly	Fixed	GBRA	NA
15110	**Guadalupe River at H-5 Dam near Gonzales**	29º28'08" 97º29'24"	Gonzales	C F A	Monthly Monthly Bimonthly	Fixed	GBRA	GBRA
15148	**Guadalupe River at US 183, Gonzales**	29º29'49" 97º27'17"	Gonzales	RBA	Quarterly	Fixed	GBRA	NA
15149	**Lake McQueeney, 0.5 mile upstream of McQueeney dam on southeast bank**	29º36'34" 98º02'10"	Guadalupe	C F A	Monthly Monthly Bimonthly	Fixed	GBRA	NA

TABLE 1 GBRA AND UGRA MONITORING STATIONS (CONTINUED)

Guadalupe River Basin Surface Water Quality Monitoring Program - 1998-99 (cont.)								
TNRCC Station Id.	**Station Description**	**Latitude/ Longitude**	**County**	**Parameters**	**Frequency**	**Monitoring Types**	**Monitored By**	**Station Owner**
12605	**Guadalupe River at Co. Rd adjacent to Herman Sons Home, west of Comfort**	29°56'56" 98°55'30"	Kerr	C F FC[8] RBA	Quarterly Quarterly Weekly[9] Quarterly	Fixed	UGRA	NA
12608	**Guadalupe River, Center Point Lake**	29°56'46" 99°02'31"	Kerr	C F FC RBA	Quarterly Quarterly Weekly Quarterly	Fixed	UGRA	NA
12678	**Johnson Creek at SH 39 in Ingram**	30°04'26" 99°14'49"	Kerr	C F FC RBA	Quarterly Quarterly Weekly Quarterly	Fixed	UGRA	NA
12682	**North Fork Guadalupe River at Gaging Station near Camp Waldemar**	30°03'29" 99°27'00"	Kerr	C F FC RBA	Quarterly Quarterly Weekly Quarterly	Fixed	UGRA	NA
12684	**South Fork Guadalupe River, Hunts Lions Park**	30°04'16" 99°19'59"	Kerr	C F RBA	Quarterly Quarterly Quarterly	Fixed	UGRA	NA

[8]The FC symbol denotes sampling for fecal coliform and *E. coli*.
[9]Weekly sampling only in months of May through September.

TABLE 1 GBRA AND UGRA MONITORING STATIONS (CONTINUED)

Guadalupe River Basin Surface Water Quality Monitoring Program - 1998-99 (cont.)								
TNRCC Station Id.	**Station Description**	**Latitude/ Longitude**	**County**	**Parameters**	**Frequency**	**Monitoring Types**	**Monitored By**	**Station Owner**
15111	**Guadalupe River at Riverview Rd., Ingram**	30º04’10” 99º13’19”	Kerr	C F RBA	Quarterly Quarterly Quarterly	Fixed	UGRA	NA
15112	**Guadalupe River at G St., Kerrville**	30º02’06” 99º08’13”	Kerr	C F M RBA	Quarterly Quarterly Annually Quarterly	Fixed	UGRA GBRA	NA
15113	**Guadalupe River at Split Rock Rd., downstream of Flatrock Dam**	29º58’52” 99º05’57”	Kerr	C F M RBA	Quarterly Quarterly Annually Quarterly	Fixed	UGRA GBRA	NA
15998	**Sandies Creek at FM 1116 7.4 km east of Smiley and approximately 3 km upstream of confluence with Elm Creek**	29º15’37” 97º33’31”	Gonzales	C F A RBA	Monthly Monthly Bimonthly Quarterly	Fixed	GBRA	NA

TABLE 1 GBRA AND UGRA MONITORING STATIONS (CONTINUED)

Guadalupe River Basin Surface Water Quality Monitoring Program - 1998-99 (cont.)								
TNRCC Station Id.	**Station Description**	**Latitude/ Longitude**	**County**	**Parameters**	**Frequency**	**Monitoring Types**	**Monitored By**	**Station Owner**
14937	**Peach Creek at CR 353**	29°30’28” 97°18’49”	Gonzales	C F A M RBA	Monthly Monthly Bimonthly Twice Quarterly	Fixed	GBRA	NA
16245	**North Fork Guadalupe River Rock Bottom Rd**	30°03’09” 99°29’04”	Kerr	FC	Weekly	Fixed	UGRA	NA
12681	**North Fork Guadalupe River at FM 1340**	30°04’44” 99°20’38”	Kerr	FC	Weekly	Fixed	UGRA	NA
12688	**South Fork Guadalupe River adjacent to LynxHaven Lodge at SH 39**	29°57’12” 99°28’57”	Kerr	FC	Weekly	Fixed	UGRA	NA
12686	**South Fork Guadalupe River adjacent to Camp Mystic**	30°00’29” 99°22’08”	Kerr	FC	Weekly	Fixed	UGRA	NA
16246	**South Fork Guadalupe River Seago Rd Crossing**	30°01’41” 99°21’42”	Kerr	FC	Weekly	Fixed	UGRA	NA
12685	**South Fork Guadalupe River adjacent to Camp Arrowhead**	30°02’06” 99°21’28”	Kerr	FC	Weekly	Fixed	UGRA	NA
12621	**Guadalupe River at SH 39 near Hunt, 0.1 km below the North/South Fork Confluence**	30°04’08” 99°19’23”	Kerr	FC	Weekly	Fixed	UGRA	NA
16241	**Guadalupe River Kelley Ck Rd off Hwy 39**	30°04’02” 99°17’29”	Kerr	FC	Weekly	Fixed	UGRA	NA
12620	**Guadalupe River at Ingram Dam in Ingram**	30°04’12” 99°14’31”	Kerr	FC	Weekly	Fixed	UGRA	NA

TABLE 1 GBRA AND UGRA MONITORING STATIONS (CONCLUDED)

Guadalupe River Basin Surface Water Quality Monitoring Program - 1998-99 (cont.)								
TNRCC Station Id.	**Station Description**	**Latitude/ Longitude**	**County**	**Parameters**	**Frequency**	**Monitoring Types**	**Monitore d By**	**Station Owner**
12619	**Guadalupe River at Bear Creek Road, 1 mi west of Kerrville**	30º03'50" 99º11'34"	Kerr	FC	Weekly	Fixed	UGRA	NA
12618	**Guadalupe River at UGRA Lake Dam**	30º03'50" 99º10'08"	Kerr	FC	Weekly	Fixed	UGRA	NA
16244	**Guadalupe River at Louise Hays Park Foot Bridge**	30º02'47" 99º08'41"	Kerr	FC	Weekly	Fixed	UGRA	NA
12617	**Guadalupe River at SH 16 in Kerrville**	30º02'42" 99º08'31"	Kerr	FC	Weekly	Fixed	UGRA	NA
16243	**Guadalupe River at Louise Hays Park Dam**	30º02'41" 99º08'29"	Kerr	FC	Weekly	Fixed	UGRA	NA
12615	**Guadalupe River at Kerrville State Park, Segment km 174.4**	30º00'40" 99º07'05"	Kerr	FC	Weekly	Fixed	UGRA	NA
12610	**Guadalupe River at Co.Rd., 0.1 mi above confluence of Turtle Creek at Segment km 166.2**	29º57'12" 99º02'45"	Kerr	FC	Weekly	Fixed	UGRA	NA
16242	**Guadalupe River at Hwy 1350 Center Point Texas**	29º56'22" 99º00'36"	Kerr	FC	Weekly	Fixed	UGRA	NA
12603	**Guadalupe River at IH 10 in Comfort**	29º58'06" 98º53'32"	Kerr	FC	Weekly	Fixed	UGRA	NA
12671	**Upper San Marcos River 0.7 downstream of IH 35**	29º52'06" 97º55'38"	Hays	FC-5x30	Semi-annually	Fixed	GBRA	NA
15481	**Lake Dunlap-Guadalupe River at dam 0.3 km north of Dittmar Falls Bridge**	29º40'23" 98º04'44"	Guadalupe	H[10] P[11]	Quarterly Quarterly	Fixed	GBRA	GBRA
16248	**Guadalupe River at City of Gonzales potable water intake**	29º29'48" 97º27'17"	Gonzales	H[10] P[11]	Quarterly Quarterly	Fixed	GBRA	NA
16249	**Guadalupe River Lake Placid in main body near dam**	29º32'54" 97º59'58"	Guadalupe	H[10] P[11]	Quarterly Quarterly	Fixed	GBRA	NA
16250	**Guadalupe River Lake Wood in main body near dam**	29º28'07" 97º29'32"	Gonzales	H[10] P[11]	Quarterly Quarterly	Fixed	GBRA	GBRA

[10]The symbol H denotes sampling for the herbicides glyphosate, fluoridone, endothal, and 2,4-D.
[11]The symbol P denotes sampling for the protozoa Cryptospordium and Giardia.

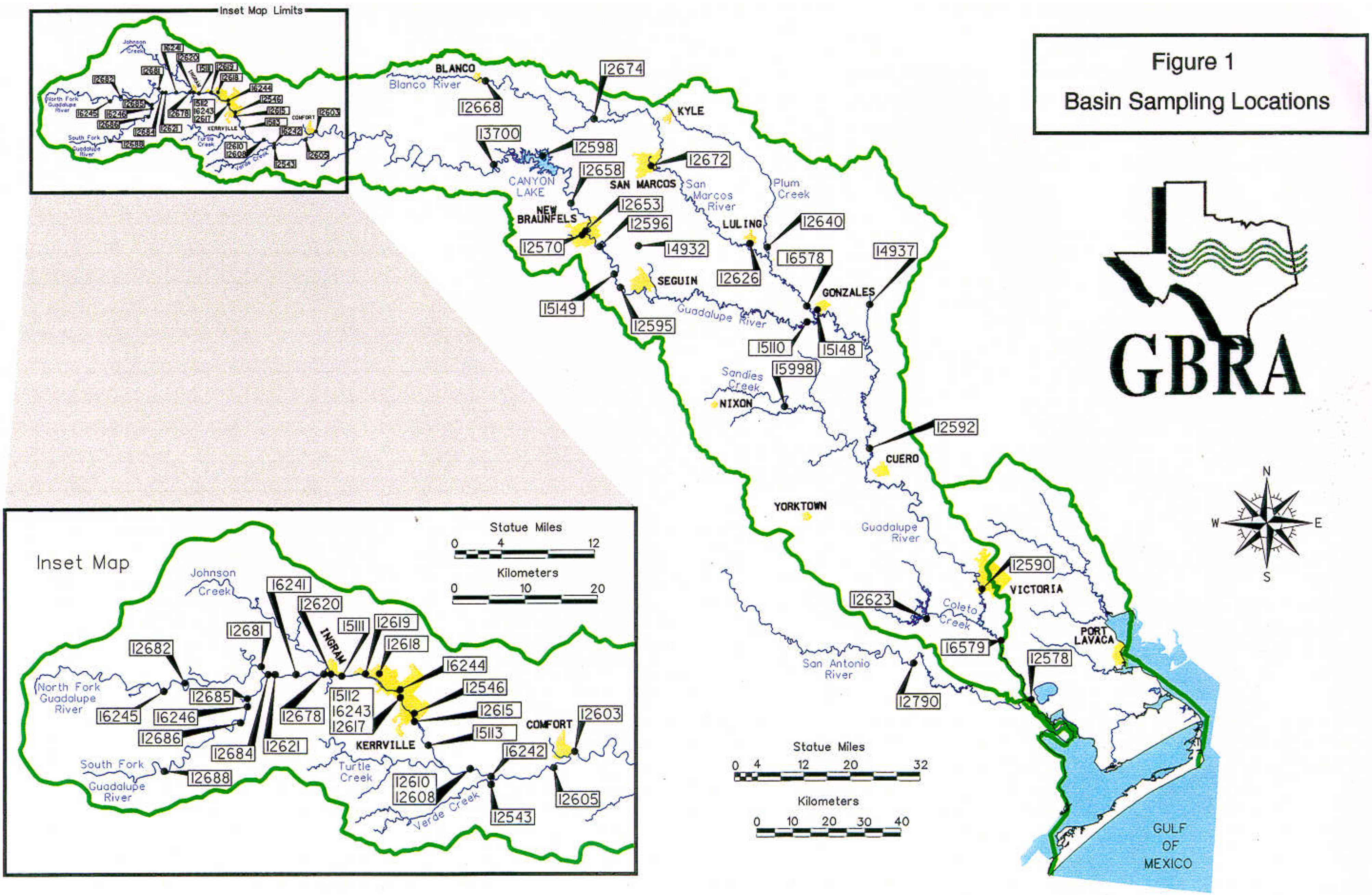


Figure 1
Basin Sampling Locations

TABLE 2 TNRCC MONITORING SITES IN FY 1999

Station Id	Station Number	Parameter/ Frequency [1]	Latitude			Longitude			Description
			°	'	"	°	'	"	
12577	1801.01000	FdCh:4, Bact:4, DisMtW:2	28	28	36	96	51	48	GUADALUPE RIVER TIDAL BRIDGE AT SH 35 NE OF TIVOLI
12595	1804.01700	FdCh:4, Bact:4, Flow:4, MtSd:2	29	33	30	98	01	54	GUADALUPE RIVER TIDAL BRIDGE AT IH 10 WEST OF SEGUIN
12600	1805.03000	FdCh:4, Bact:4	29	53	45	98	16	57	CANYON LAKE MID-LAKE SOUTH OF POTTERS CREEK PARK AT WEST END OF PARK
12601	1805.04000	FdCh:4, Bact:4, MtSd:2	29	54	33	98	19	54	CANYON LAKE HEADWATERS ABOVE CRANES MILL PARK
14255	1806.00600	FdCh:4, Bact:4, Flow:4	29	51	12	98	24	28	GUADALUPE RIVER AT US 281 NORTH OF SAN ANTONIO
12622	1807.01000	FdCh:4, Bact:4, Flow:4	28	42	42	97	02	03	COLETO CREEK AT US 77 SOUTH OF VICTORIA
12656	1812.00950	FdCh:4, Bact:4, Flow:4 5xBact:2	29	42	50	98	06	25	GUADALUPE RIVER AT THE BEGINNING OF CYPRESS BEND PARK IN NEW BRAUNFELS
13656	1812.02000	FdCh:4, Bact:4, Flow:4 24hrDO:2	29	51	32	98	10	47	GUADALUPE RIVER 200 FT. UPSTREAM FROM HORSESHOE FALLS, 0.8 MI. NORTH OF SATTLER, 1.8 MI. DOWNSTREAM FROM CANYON DAM

[1]Abbreviations: FdCh:4= field/chemical(conventional) parameters are sampled four per year; Bact:4= Fecal coliform-4 per year; DisMtW:2= dissolved metals in water-two per year; MtSd:2= metals in sediment-two per year; 5xBact:2=geometric mean-5 samples/30 days-2 per year; 24hrDO:2= 24 hr continuous monitoring for dissolved oxygen-2 per year.

document required by the TNRCC that provides very thorough documentation of all aspects of sample collection, analysis and data management procedures. By having the important details specified, it has been possible to consider the monitoring data from all agencies together, greatly enhancing the overall value of the data collected.

SPECIAL STUDIES

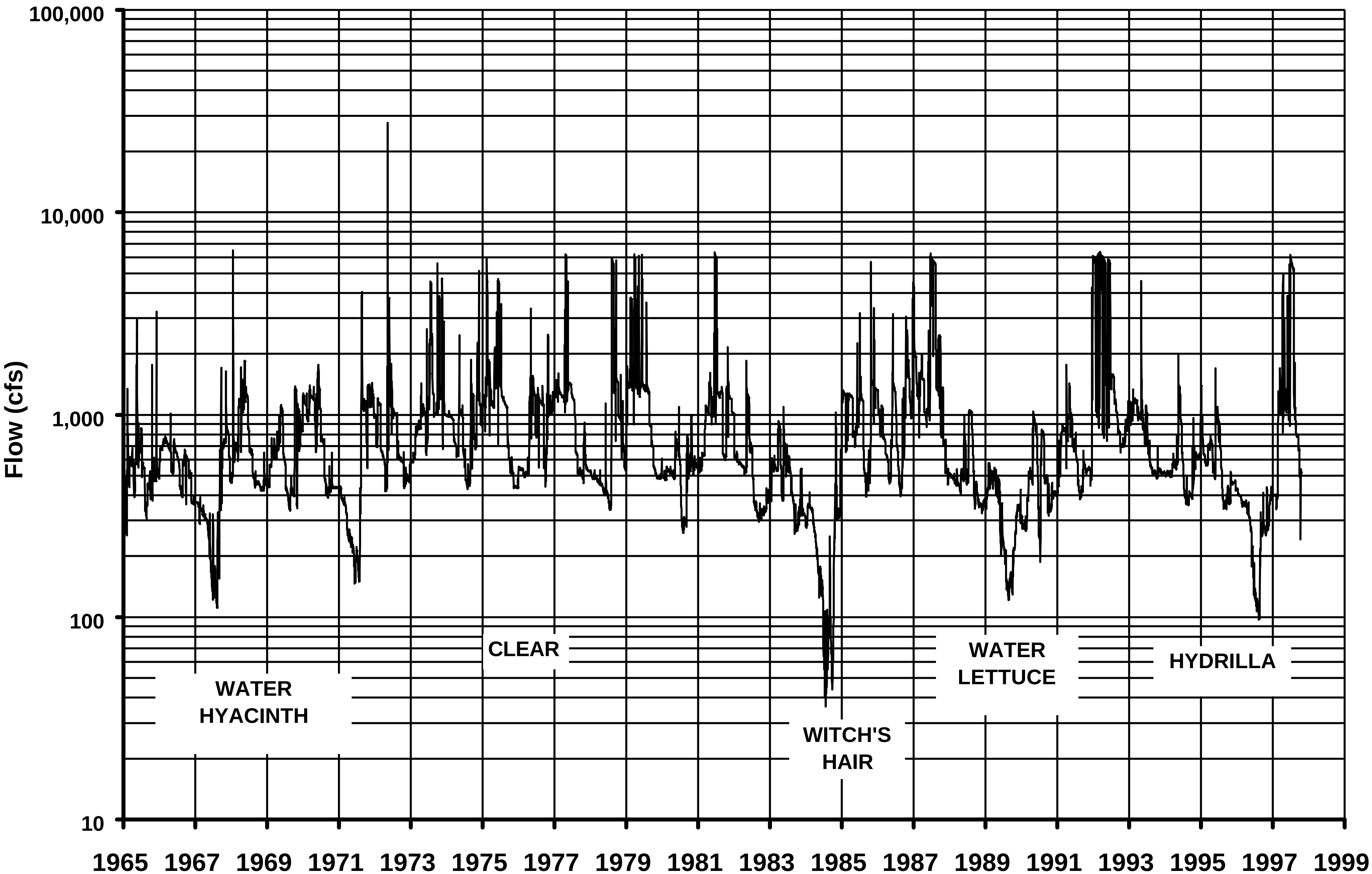
During the summer of 1997 a meeting with the Basin Steering Committee was held to obtain their guidance on how the program should be directed in the next 2-year period. To the extent possible and consistent with TNRCC requirements, Committee suggestions were incorporated in a draft work plan. Because of actions by the last legislature, some of these had to be deferred to allow for a special monitoring program dealing with poultry operations in Gonzales County. This section briefly describes the special study projects. These included a follow-up on Lake Dunlap algae problems, the special poultry study added by the legislature, an examination of development effects in Kerr County, and special pathogen and herbicide monitoring. All but the poultry study were conducted at the request of the Basin Steering Committee.

One of the efforts of the CRP has been an analysis of the possible need for point source nutrient removal to help control accelerated aquatic plant growth on the hydro lakes. In the last two years considerable effort has gone into data analysis, monitoring, determining the relationships between river flows and nuisance conditions and performing an economic assessment of the situation. Figure 2 shows the historical river flows at Lake Dunlap and aquatic plant problems in the periods 1965-72, 1984, 1989-90. During periods of low flow, wastewater discharge is a significant part of the total nutrient input to Lake Dunlap. While wastewater nutrient removal would be desirable during low flow periods, it would be hard to justify because of the large cost and relatively infrequent need. However, use of the effluent for irrigation during dry periods does appear useful and cost-effective.

The poultry study required by the legislature was designed to see if poultry raising and associated waste disposal operations were having a significant effect on water quality. The study involved monitoring four small creek sites in Gonzales County, two with a significant number of poultry houses and two reference sites that had relatively few poultry houses upstream in the watershed. Sites were selected on what were believed to be perennial streams, based on extensive review of aerial photographs and coordination with local interests. Monitoring of the four sites on approximately a monthly basis continued from November of 1997 though August of 1998. Analysis of the data indicated there was little evidence of differences between water quality at the poultry versus the reference sites. For example, a statistical evaluation of differences between the poultry and reference sites found that of 15 parameters analyzed for each pair of stations, only one was significant, nitrate-nitrogen concentration at the Sandies Creek Poultry site versus the Peach Creek Reference site. There were no significant differences at the Elm Creek Poultry and Reference sites. At the same time, natural variability limits the conclusions that can be obtained from a short-term study. Similar results were obtained in a study in the Upper Neches Basin, and the TNRCC has produced a report to the legislature summarizing the overall results.

Since the completion of the poultry study, work has shifted to two other projects that were identified by the Steering Committee. One is special sampling of river waters for

FIGURE 2 GUADALUPE RIVER FLOW AND ALGAE PROBLEMS AT LAKE DUNLAP



Plots Chart 3 9/1/99 11:50 AM KLL

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two pathogenic organisms that are a known concern in surface water systems, Cryptosporidium and Giardia, and selected herbicides that may be used in the basin. This sampling and analysis effort to determine if there was a concern with these parameters, was reinstated after the TNRCC was able to allocate additional funds. At this point, one sampling of five stations has been performed, with no pathogen or herbicide detections. The second project is an analysis of urban growth effects in the Kerr County area on storm water runoff and receiving water quality. Figure 3 illustrates growth in Kerr County and the City of Kerrville since 1961. The growth in urban area, plus population growth in the city and county, is being used to estimate the increase in impervious cover. This in turn is being used to estimate the increases in runoff volume and the loading of various constituents.

DATA ANALYSIS FOR TRENDS AND CONCERNS

The two river authorities have been collecting data for over a decade, and a number of special analyses have been performed. Although the full data analysis envisioned in the TNRCC's basin permitting cycle is not scheduled to begin until after the year 2000, this section provides a short summary of findings on temporal trends. Figures 4-6 illustrate the long-term records of four key water quality parameters in the study area. Three stations are considered:

12615, Kerrville State Park, and 12616, G Street, both downstream of the City of Kerrville,
12658, River Road 2nd Crossing upstream of New Braunfels, and
12592, Old San Antonio Road west of Cuero, at FM 766.

For each station the time history of conductivity, dissolved oxygen (DO), nitrate-nitrogen (NO_3-N), and fecal coliform bacteria (FC) is presented. In general, the data do not suggest a discernable temporal trend. It is believed this is because there have been no major changes in land use or wastewater discharges in the last decade.

One change that has occurred during the last several years has been the start of the Total Maximum Daily Load (TMDL) program. Very briefly, under the new program the state must determine what stream segments are not meeting water quality standards and place those segments on a list known as the 303(d) list. Where appropriate, a TMDL study would have to be conducted to determine what action is necessary to bring the segments into compliance with the standards.

The earlier draft 303(d) lists did not include any segments in the Guadalupe River Basin. However, the most recent draft list has included a number of basin segments, most listed because of DO being sometimes lower than the standard to assure optimum aquatic life, or FC levels that sometimes exceed the criterion for contact recreation:

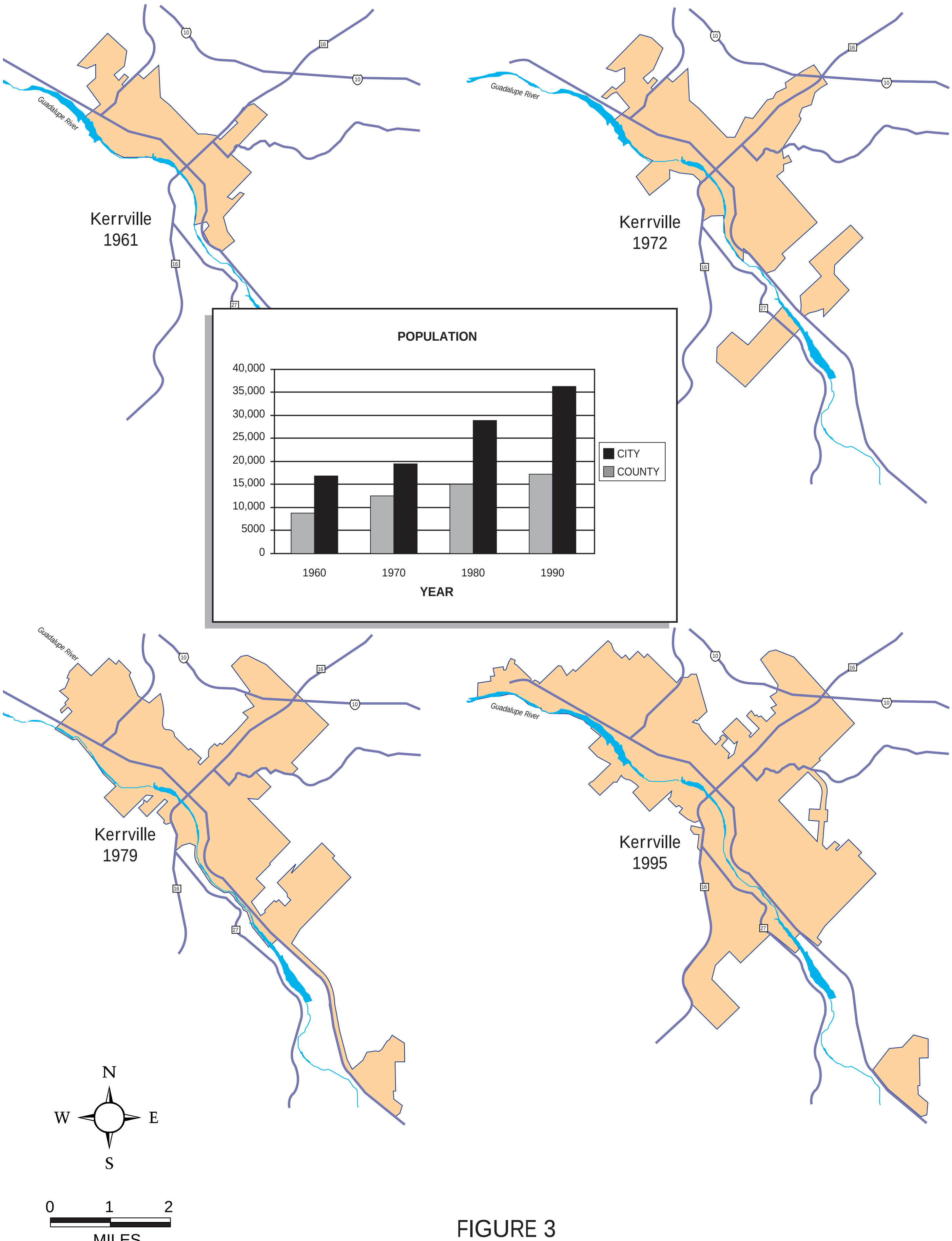


FIGURE 3
GROWTH IN THE KERR COUNTY AREA

FIGURE 4
WATER QUALITY DATA FROM GUADALUPE RIVER BELOW KERRVILLE STATE PARK

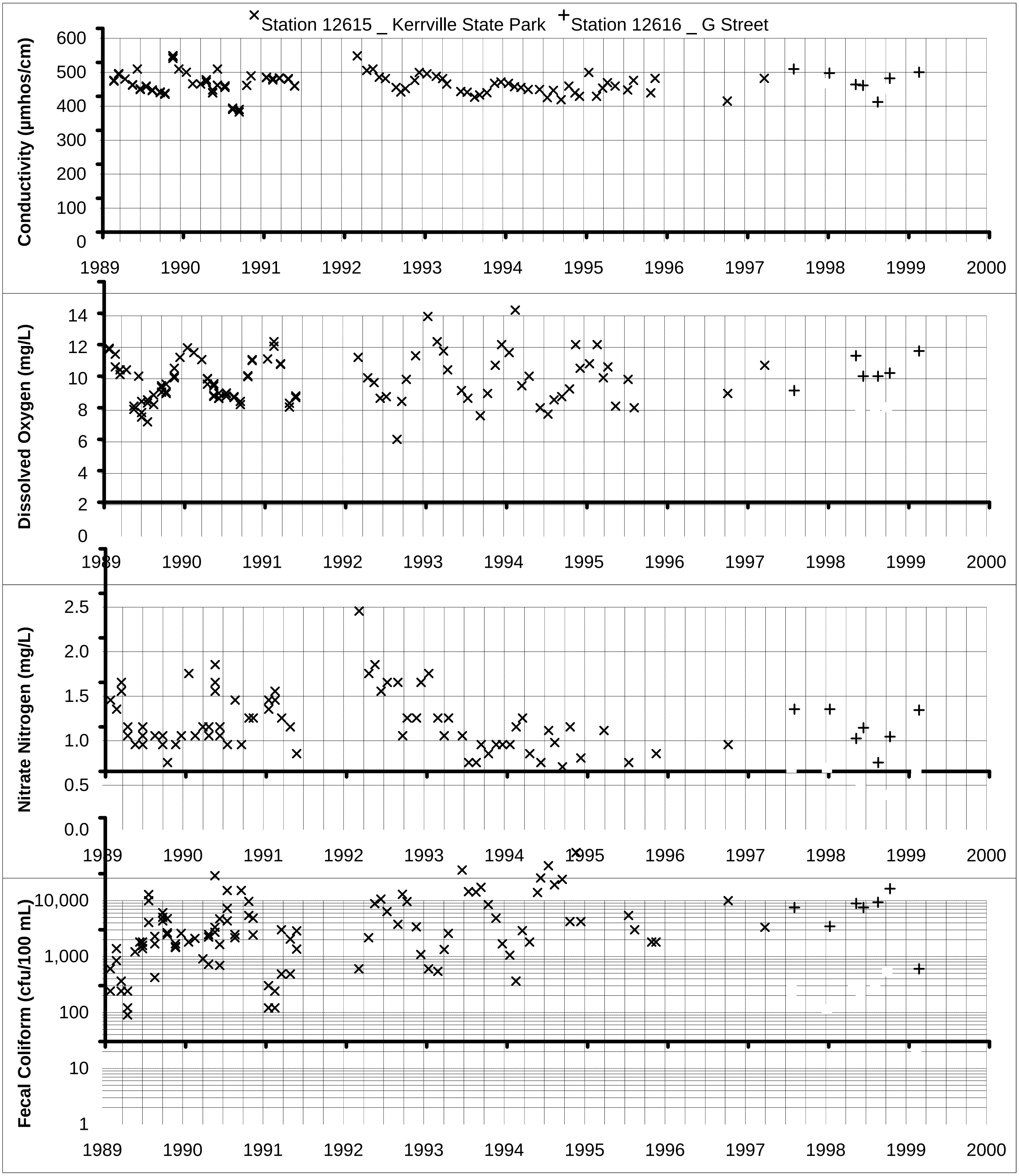


FIGURE 5
WQ DATA FROM GUADALUPE RIVER AT RIVER RD 2ND X'ING, U/S OF NEW BRAUNFELS

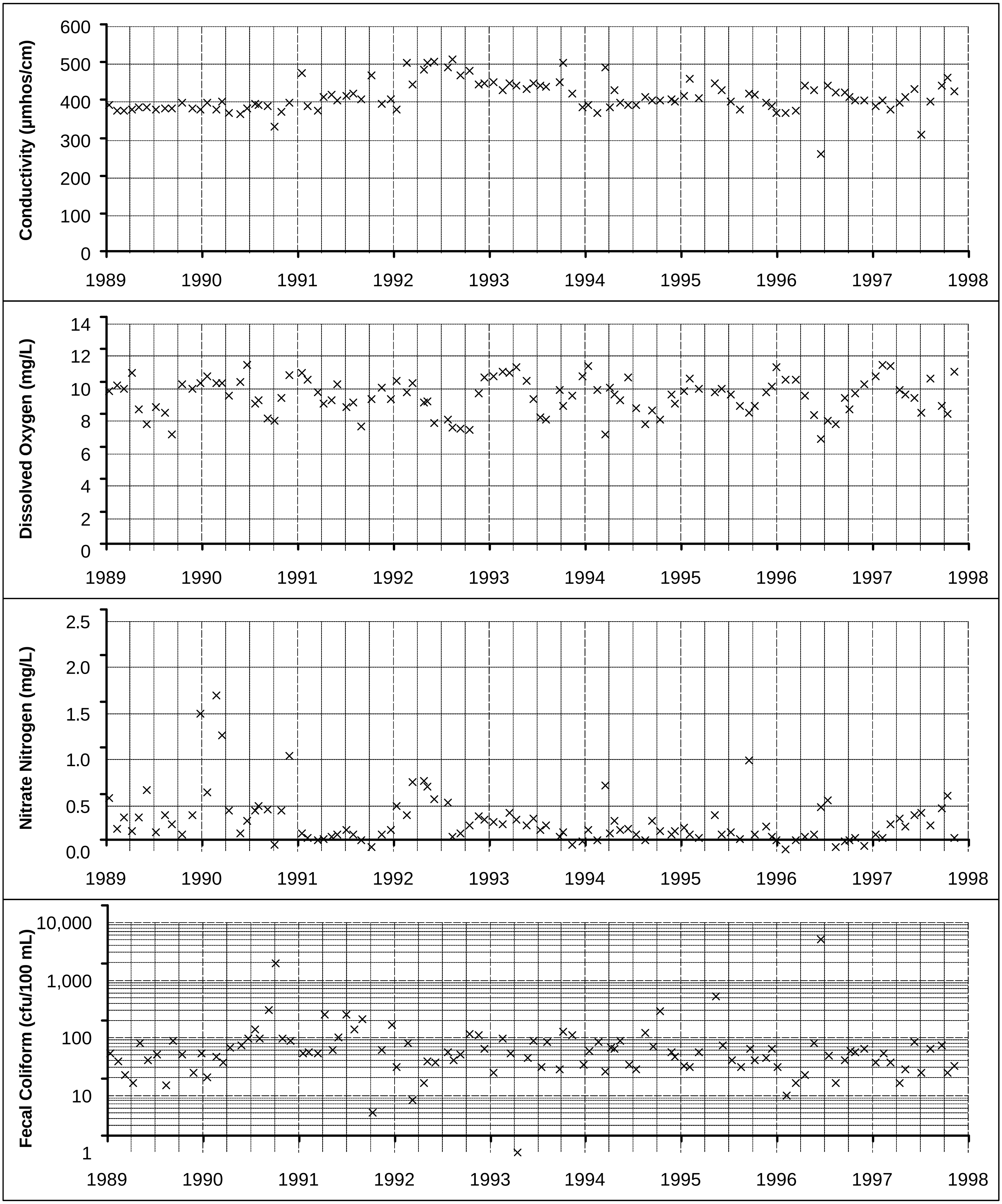
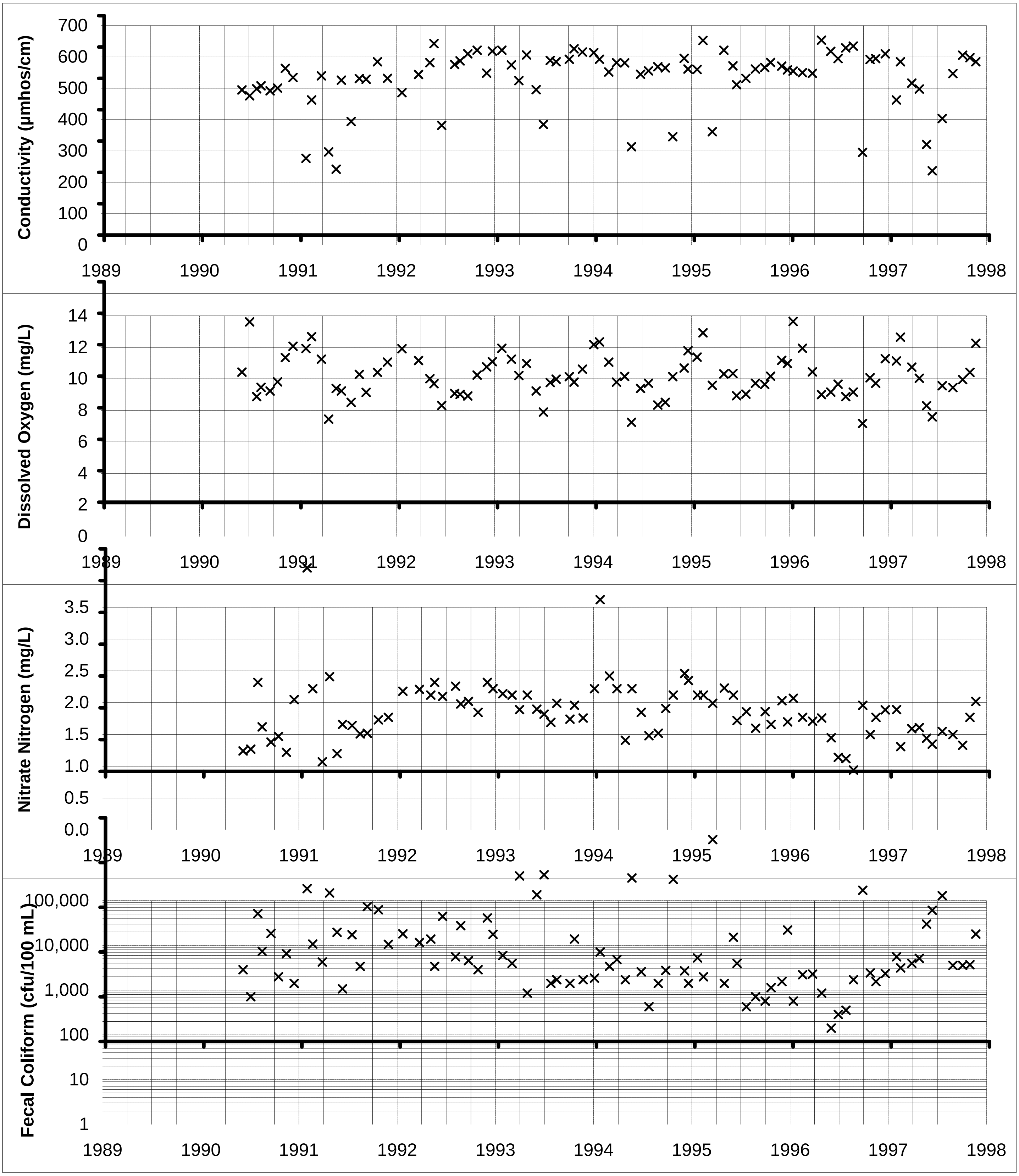


FIGURE 6
WQ DATA FROM GUADALUPE RIVER AT OLD SAN ANTONIO RD (FM 766) WEST OF CUERO



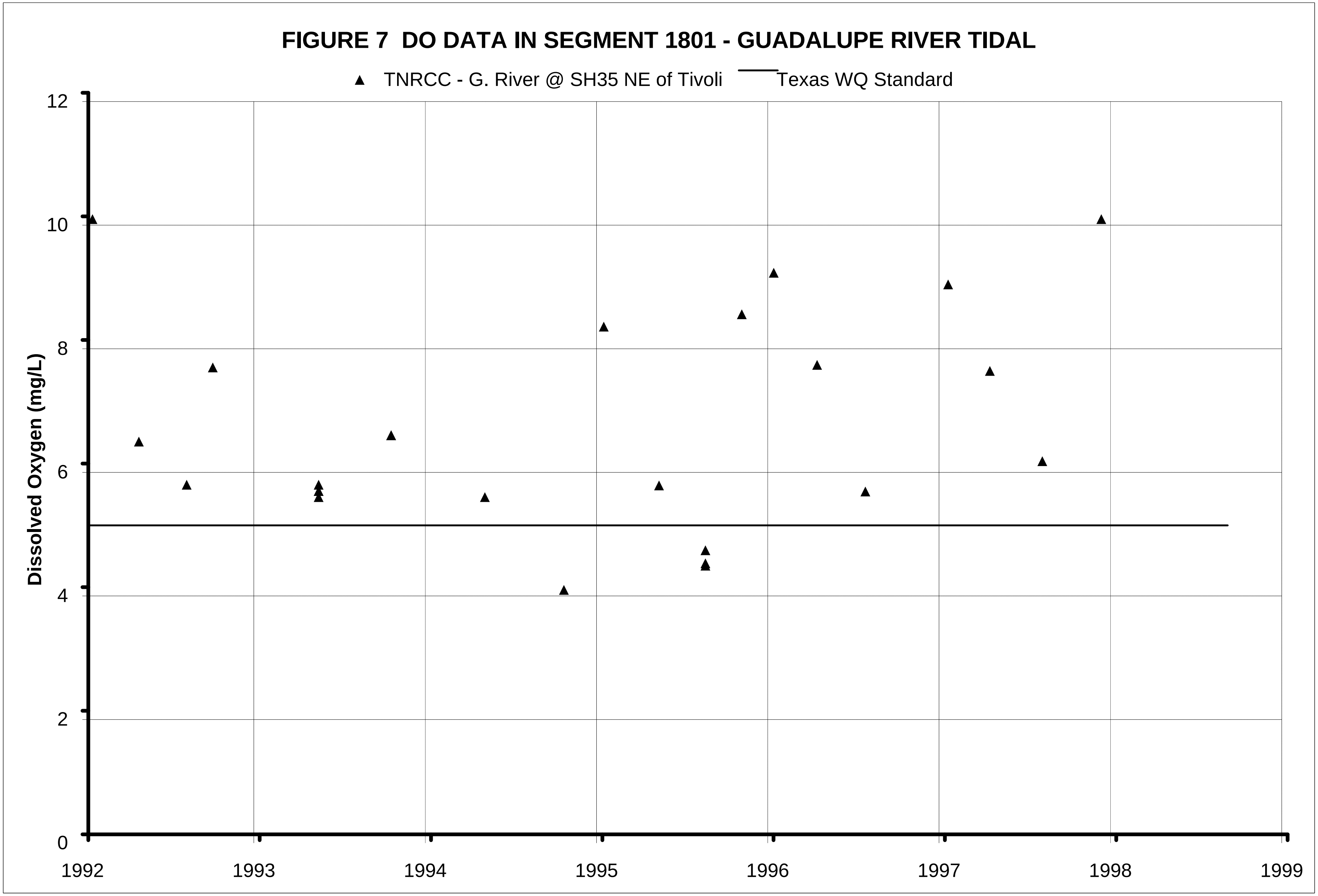
Segment	Name	Description
1801	Guadalupe River Tidal	DO
1803A	Elm Creek (Unclassified)	DO, FC
1803B	Sandies Creek (Unclassified)	DO
1804B	Peach Creek (Unclassified)	FC
1806A	Camp Meeting Creek (Unclassified)	DO
1806G	Verde Creek (Unclassified)	DO
1811A	Dry Comal Creek (Unclassified)	FC
1814	Upper San Marcos River	Sulfate
1815	Cypress Creek	DO

The GBRA has reviewed the information provided by the TNRCC and has requested that the draft listing be revised. With the unclassified waters, the screening was done using a limited amount of data from small creeks that do not have site-specific designated uses and criteria. Because of their size, these creek stations exhibit substantially more variation in flow and quality parameters than the main stem of the river where specific criteria have been assigned. The GBRA and UGRA do not believe that we have enough experience with these small creeks to allow an accurate determination of standards compliance, and propose to work closely with the TNRCC in the future to improve the level of understanding.

In the case of the sulfate level on the Upper San Marcos River, it appears that the standard may need adjustment to better reflect natural background conditions. The TNRCC is beginning to update the Surface Water Quality Standards, and the GBRA has requested that the sulfate criterion in this segment be revised.

Natural DO levels exhibit a great deal of variation in response to seasonal temperature changes, dissolved solids concentration, and biological conditions. The DO concentration can also show substantial variation during a day and with water depth. Figure 7 shows the DO data for Segment 1801, the tidal portion of the Guadalupe River downstream of the Saltwater Barrier, collected from the river at State Highway 35. It appears that four values were enough to have 10% of the observations be lower than the segment criterion, and thus trigger getting on the draft list. Of the four, three were from a sample in the summer of 1995 taken at three depths and counted as three samples, and one was a lower value collected in the fall of 1994. The GBRA believes this is a good example of the complexity of the problem of screening for non-compliance with the standards. On one hand, “hard” numbers are needed for some applications, but at the same time there needs to be a way to consider natural variability. The GBRA has made recommendations for changes in the screening levels and standards that would tend to reduce or eliminate these kinds of situations, and intends to work closely with the TNRCC to help the process function smoothly.

The FC data are similar in many ways. However, in this case the TNRCC has recognized the problem and has commissioned a statewide Bacterial Indicator Study to examine the entire issue including the standards, monitoring procedures and screening methods. This study is being managed by the GBRA and conducted by PBS&J.



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The issues involved in 303(d) listing decisions are complex, with a continuing evolution of screening procedures anticipated. We expect the process to continue for a number of years, and the GBRA and UGRA are committed to working with the TNRCC and seeing that good data and science are the basis for listing. Where there is an indication of human activities causing a water quality impact, or even a correctable natural water quality impairment, the GBRA and UGRA believe that the TMDL process may be an effective way to analyze a problem and lead to an improvement.

COMMUNICATING RESULTS

The CRP in the Guadalupe Basin continues a high profile of activity in public communication. The GBRA maintains a number of communication mechanisms to support the CRP. These include the quarterly Water Resource Reports, issuing press releases dealing with various water topics, and making public presentations to school and other interested groups. The UGRA has a similar level of public outreach on water quality issues.

Both authorities have internet web pages (www.gbra.org and www.ugra.org) that provide information to the public on topics of interest in the basin. The GBRA web page provides links to a range of information on river flows and quality conditions. It provides access to water quality data that have been collected by the two authorities over the years along with data collected by the TNRCC and the USGS. In addition to developing the web pages, the two river authorities have updated the Guadalupe River basin water quality information and provided the new information to the TNRCC in computer database files.